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## Paraguay

## Bio-Fuels

## Annual

## 2007

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**Report Highlights:**

Paraguay has the potential to become an important player in the world's biofuel market. It has resources to produce both ethanol and biodiesel. However, large investment will be needed to make this a reality. There is a biofuel law which regulates the business and sets mixing requirements which are currently 18-24 percent for ethanol in gasoline and 1 percent for biodiesel in diesel. The domestic market for biofuels has significant potential as Paraguay needs to import all the petroleum it uses and it could also be a large exporter.

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Includes PSD Changes: No  
Includes Trade Matrix: No  
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*Situation and Outlook*

Paraguay has the potential to become an important player in the world's biofuel sector. It has very good weather, rich soils, a broad agricultural base and culture, and the opportunity to add value to much of their current agricultural production. There is currently significant interest in developing this business. So far, investment has been in small plants, but there are some projects of medium-scale plants, which are expected to come true in the next few years.

Paraguay imports all the oil it uses. Since 1999, gasoline has been mixed with ethanol at different blending levels. However, 80 percent of fuel consumption is diesel. On October 2005, Paraguay passed a law promoting biofuels. The main objectives behind this law are to diversify the supply of renewable energy, diminish the dependence on imported fossil fuel, substitute fossil fuel with renewable fuels, improve environmental quality, develop the farm sector (focused primarily on small producers), and to export ethanol and biodiesel.

**Biofuel Policy**

On October 2005, the Paraguayan Congress passed Law 2748 of Biofuels Promotion. The main points of this Law and its following decrees are:

- It declares production of biofuels to be of "national interest".
- It recognizes biodiesel, anhydrous ethanol and hydrated ethanol as fuels.
- Establishes minimum mix mandates for biodiesel at 1 percent in diesel for 2007, 3 percent in 2008, and 5 percent for 2009. The maximum blending mix at gas stations can reach 20 percent.
- Establishes mix mandates for ethanol of a minimum of 18 percent and a maximum of 24 percent in gasoline of 95 octanes or under. As from 2008, all gasoline will have to be blended with 25 percent ethanol.
- Biofuel use is mandatory as long as there is sufficient local supply.
- It encourages the production of different feedstock for biofuel production, which has to be of local origin.
- Some tax benefits are provided, especially concerning investment.
- The Ministry of Industry will control investment and will determine production levels. The Ministry of Agriculture and Livestock will certify feedstock.

Both the official and private sectors are proposing some changes to the law, which are currently under study in Congress. The two most important proposals are the elimination of the VAT on biodiesel and the reduction of import duties on fuel flex vehicles to encourage a larger consumption of ethanol.

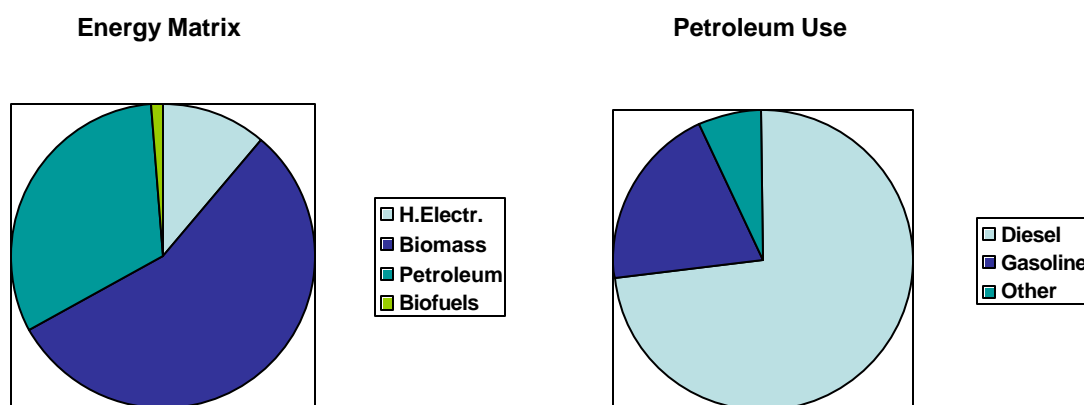
**The Energy Market**

Paraguay is an important producer of hydroelectricity, with significant exports to Argentina and Brazil. However, the largest source of energy consumed domestically is biomass, mostly wood and charcoal, which is widely used in homes and the industry. Following are petroleum products which are imported (Paraguay does not produce oil or gas), hydroelectricity, and finally biofuels with just 1 percent of the total. Of the country's total energy consumption, industry, transportation, and residential/commercial sectors demand roughly one third each.

In 2007, Paraguay consumed approximately 1.03 billion liters of diesel and 300 million liters of gasoline. Small volumes of kerosene and fuel oil were also consumed. Petropar, the national oil company, practically monopolizes the diesel market by importing and selling it to distributors at subsidized prices. Gasoline does not have a fixed price so private oil distributors participate in this business.

There are five gas stations, most of them located in the east border with Brazil, which sell hydrated ethanol.

## Paraguayan Energy Matrix and Petroleum Use



### Ethanol

Resolution 234 of April 2007 established the current blending requirements for ethanol with gasoline. Gasoline of 85 octane and lower needs to be blended with a minimum of 18 percent and a maximum 24 percent of ethanol, while 95-octane gasoline can be mixed up to 18 percent. Approximately 55-60 million liters of ethanol will be needed to comply with official mandates. In 2007, production is expected to reach 50 million liters, lower than expected due to technical problems at the plants and some difficulties with the sugar cane crop.

Paraguay has had a mixing requirement since Decree 2162 of March 1999 and its following resolutions. First it established that gasoline be mixed with 7 percent ethanol.

Ethanol in Paraguay is practically all done from sugar cane and molasses, with small volumes using grains as feedstock. Production for 2008 is forecast at 70 million liters, while production capacity is significantly higher (some 100 million liters could be produced from sugar cane and 10 million liters could be made from cereals). Official projections for 2010 set ethanol production at approximately 160 million liters, domestic consumption at almost 90 million liters and exports at 70 million liters.

There are nine sugar mills in Paraguay, of which two have distilleries that produce anhydrous ethanol. In addition, there are three distilleries, which produce hydrated ethanol, and no sugar. One of the sugar mills utilizes grains once the sugar cane harvest is over. Petropar,

Paraguay's national oil company is the largest ethanol producer, accounting for 40 percent in 2006.

Paraguay is the world's largest exporter of organic sugar. It has over 82,000 hectares planted with sugar cane, and official studies indicate that the country has the potential to expand to 450,000 hectares. Sugar cane is produced in 14 of the 17 departamentos (states), but the largest concentration is in the central part of the eastern region. Planted area has been growing continuously since 2001. Sugarcane production has a strong social and economic importance as more than 25,000 farmers, most of which are small, make a living with it.

Based on 2006 data, almost two thirds of the sugar cane was used to produce conventional and organic sugar, and one third to produce ethanol. A few sugar mills produce ethanol from molasses. Private sources indicate that one hectare of sugar cane processed exclusively for ethanol yields about 4,000 liters.

There is one sugar mill that has recently invested in an ethanol plant, which can use grains, primarily sorghum and corn. Paraguay's historic corn production is about one million tons, used domestically for animal feed and human consumption. Another alternative feedstock for ethanol production is manioc or cassava, which is widely produced on about 300,000 hectares in Paraguay.

Official projections indicate that by 2015, Paraguay could export \$400 million worth of ethanol, saving \$40 million from smaller oil imports, attract \$1 billion in investment and plant 140,000 hectares of new crops. This demonstrates the dynamism and importance of ethanol production in a country, which has very good agricultural aptitude, and practically no fossil fuel resources.

#### Biodiesel

Resolution 235 of April 2007 declared mandatory the blending of 1 percent biodiesel in diesel. Therefore, the volume of biodiesel should total approximately 6 million liters in 2007, but private sources estimate that only half of it will be fulfilled. So far, biodiesel is produced from animal fat. In 2007, local fat supply was inadequate because a strong drought negatively affected cattle production and high international fat prices encouraged tallow exports to Brazil and Bolivia. This same resolution established that in 2008 the blending with biodiesel would increase to 3 percent. Contacts indicate that Paraguay will have the processing capacity to supply 30 million liters of biodiesel, but given market conditions, and with government promotion, output could reach about 20 million liters (representing a 2 percent mix). Over 50 million liters of biodiesel will be needed to comply with the official mandate in 2009. Private sources indicate that by that time, at least one of the several investment projects in medium-scale biodiesel plants will be operating.

During 2007, the government approved the first four biodiesel plants all of which use animal fat as the main feedstock (they are also capable of using vegetable oil, while one company also utilized recycled cooking oil). Two leading local meat packers own biodiesel plants. There are many projects announced to build plants, but just a few are expected to become true in the near future. In 2008, some 3-4 new small plants will be in line to produce, with a total country production capacity of 45 million liters a year. Contacts indicate that a group of investors from the US and Paraguay will build a vegetable oil crushing plant and a plant to produce 225 million liters of biodiesel per year. This would be the largest plant in Paraguay, but production would commence in 2009. This new plant is projected to begin production with soybeans, and then switch to other feedstock such as rapeseed and sunflower.

Paraguay's soybean crop in 2006-07 totaled 6.5 million tons, of which just a quarter was processed domestically to attend the export market of meal and oil. Crushing capacity is expected to grow in the future, as a few companies have announced the intention of expanding production. Soybeans, which are not processed, are exported in beans primarily to Argentina. Paraguay provides good opportunities for the local soybean/biodiesel complex, as it eventually could replace the importation of fossil diesel with renewable fuels produced from locally grown feedstock. If the entire demand of diesel would shift to locally produced biodiesel, Paraguay would save over \$500 million in imports every year.

Apart from animal fats and soybean oil, Paraguay has good potential in producing biodiesel from Coco or Mbokaya (*Acrocomia totai*) which is widely grown in a vast area of the country. There are also studies to incorporate rapeseed as a winter rotation in the soybean area, which could expand productivity per hectare significantly. Sesame seed, sunflower, canola, castor oil, Tung and peanuts are some other alternatives, which could expand in the future depending on productivity and market conditions.

Paraguay currently lacks a laboratory that can fully analyze biodiesel. Some tests are sent to be done in neighboring countries. However, in the next few months, new equipment will be incorporated. Petropar is expected to have its own laboratory by next year.

The official sector estimates that by 2015, Paraguay could export \$250 million in biodiesel, while saving \$60 million in diesel imports. To reach these levels, investment could reach a total of \$400 million.

#### Future Feedstock

There is limited official research done in feedstock for biofuel use, but there are plans to increase resources. Some private entities and companies, for example sugar mills, conduct their own research, focused primarily on genetics, yield efficiency, and crop management. Sugarcane remains the most promising feedstock for ethanol. The use of grains, such as sorghum and corn, is expected to be more limited.

Many people in Paraguay indicate that the commercial production of *Jatropha curcas* and *Acrocomia totai* are the future feedstock for biodiesel. Both of them have very good production of oil per hectare, they are longevous plants, are well adapted to Paraguay's environment, and their fruits are not for human consumption. Research is underway and commercial production could begin in about 5-7 years.

#### Trade

Paraguay does not export ethanol or biodiesel. However, as the industry develops and current and future investments come on line, there will be exports of both biofuels. Some sources project that by 2015, Paraguay could export approximately 1 billion liters of ethanol, and 300 million liters of biodiesel. The potential domestic consumption of ethanol is quite limited as the local vehicle market is primarily based on diesel engines. Low-cost sugarcane ethanol and limited local consumption of gasoline, opens great potential for large exports. Biodiesel in the near future will be directed more at the domestic market in order to replace large expensive diesel imports. Once the local market of biodiesel is well supplied, exports will flow more regularly, as long as many of the current investment projects come to fruition.

Paraguay is a landlocked country surrounded by Argentina, Bolivia and Brazil. However, it has good connections to the Atlantic Ocean with a barge system through the Paraguay and Parana rivers, and with a trucking system to Paranagua port in Brazil (800 kilometers away from the eastern border of the country).

Paraguay will need to invest in infrastructure and logistics (terminals, storage, transportation, etc.) in order to be able to export large volumes of biofuels in the future.

Imports of biofuels into Paraguay are prohibited. However, they can be imported with a special official authorization.

#### Regional and Bilateral Agreements

In mid 2007, the Presidents of Brazil and Paraguay signed a Memorandum of Understanding on Biofuels. The main areas of cooperation and work are the following: evaluation of different feedstock' potential; technological development of biofuel industrial processes; analysis of the system of infrastructure and logistics to have a production and commercial integration; and investment in the Paraguayan biofuels sector. Paraguay is currently working closely with the Brazilian Agricultural Research Corporation (Embrapa) in transferring technology, and identifying the most suitable feedstock.

At the end of 2006, the Mercosur region established a Special Working Group on Biofuels. The first meeting of this group took place in Uruguay and the four countries of Mercosur and Venezuela participated. In late 2007, they defined an action plan. The main points were: evaluation of the production capacity of different feedstocks and different areas of production; identification of research organizations and entities to encourage joint work; analysis of current regulations; analysis of the infrastructure and distribution of fuels; and identification of tools to promote investment in the biofuels sector.

## Statistical Information

Quantity of Feedstock Use in biofuel Production in MT						
		2003	2004	2005	2006	2007
<b>Biodiesel</b>						
Vegetable Oil						
	Soybean oil					
	Rapeseed Oil					
	Palm oil					
	Coconut oil					
	Animal Fats					3,000
	Recycled Vegetable oil					
	Other					
<b>Ethanol</b>						
	Corn/Sorghum					14,000
	Wheat					
	Sugarcane	208,000	238,000	267,000	270,000	250,000
	Sugar beat					
	Rye					
	Molasses	73,000	83,000	94,000	96,000	87,500
	Wood					
	Cassava/tubers					

Biofuel production/Consumption/trade (million liters)					
	2003	2004	2005	2006	2007
<b>Biodiesel</b>					
Beginning stocks*					0
Production					3
Imports					0
Total supply					3
Exports					0
Consumption					3
Ending stocks*					0

Biofuel production/Consumption/trade (million liters)					
	2003	2004	2005	2006	2007
<b>Ethanol</b>					
Beginning stocks*	0	0	0	0	0
Production	35	40	45	46	50
Imports	0	0	0	0	0
Total supply	35	40	45	46	50
Exports	0	0	0	0	0
Consumption	35	40	45	46	50
Ending stocks*	0	0	0	0	0